REMARKS

These amendments and remarks are in response to the Final Office Action ("Office Action") dated November 1, 2011. This response is accompanied by a Request for Continued Examination (RCE). Applicant requests a three-month extension of time and authorization is given to charge Deposit Account No. 50-0951 for the extension fee, the RCE fee, and any other appropriate fees.

In the Office Action, claims 1-6 and 8-13 were pending. Claims 1-6 and 8-13 were rejected under 35 U.S.C. §103(a). The rejections are discussed in more detail below.

I. Rejections under 35 U.S.C. §103

In the Office Action, claims 1-6 and 8-13 were rejected under 35 U.S.C. §103(a) as being unpatentable over PCT Publication No. WO 03/095060 to Gandolfi et al. ("*Gandolfi*"), in view of European Patent Publication No. 60238492 to Nagano ("*Nagano*") and, it appears, further in view of the alleged obvious design choice of hot-drawing or welding a layer of zirconium onto a layer of titanium. Applicant submits that the claims are patentable over these references.

The Office Action asserts that *Gandolfi* discloses a tube bundle heat exchanger for treating corrosive fluids comprising at least one tube composed of titanium. Notably, however, *Gandolfi* teaches away from constructing a tube bundle heat exchanger without providing strengthening from steel, either as an outer layer to a tube or as an upper tube plate. It also teaches away from using titanium and zirconium together. On page 3, lines 3-17, *Gandolfi* teaches in relation to metals including titanium and zirconium that "[a]n apparatus of this type however would not be economically convenient if it were entirely constructed with these corrosion-resistant alloys or metals, not only due to the considerable quantity of costly materials which would be necessary for the purpose, but also as a result of structural and construction problems due to the necessity of using special welding and bonding methods and, in certain cases, to the lack of certain metallic materials having the excellent mechanical qualities of carbon steel." *Gandolfi* goes on to state on page 3 that normally a container or column of carbon steel is used "whose surface in contact with

corrosive or erosive fluids is uniformly covered with a metallic anticorrosive lining from 2 to 30 mm thick." *Gandolfi* addresses the problems of lining steel with zirconium, titanium or one of their alloys which creates considerable applicative problems in terms of construction engineering due to the lack of homogeneity of the welded joints. Thus, *Gandolfi* teaches that using steel for many of the components is necessary, at least in order to withstand the pressures generated within the apparatus.

On page 11, *Gandolfi* teaches a tube whose internal wall consists of "titanium, zirconium or an alloy of one of them" (page 11, lines 1-4, emphasis added) which may pass through a cavity that has a three-layer wall, consisting of an external layer capable of resisting pressure, an intermediate layer of stainless steel, and an anticorrosive inner layer consisting of "titanium, zirconium or an alloy of one of them" (page 11, lines 9-18). As correctly noted in the Office Action, this does not teach that the tube in this embodiment is entirely formed of "titanium, zirconium or an alloy of one of them" but rather is a bimetallic tube including stainless steel.

The Office Action relies on page 18, first paragraph for a teaching that a tube can consist entirely of one of titanium, zirconium, or an alloy of one of them with another metal. The preferred embodiment employs zirconium. When compared with the embodiment of figure 3 which shows this arrangement, it is noted that the description of the embodiment of figure 3 is solely related to a tube formed of zirconium (see for instance description, page 36, line 24 to page 37 line 2). The tubes 4 extend through a four-layer wall 21, 22, 30, 23 of the cavity, and are strength and seal welded only to the zirconium layer 23 which forms the inner lining of the cavity. The zirconium layer 23 is applied to the intermediate stainless steel layer 22 or to the additional carbon steel layer 30 by explosive cladding. It is noted that the upper layer 21 is a pressure-resistant layer formed by carbon steel. Thus, it is clear that the zirconium is strengthened by the steel wall of the cavity, and also that zirconium is not used in combination with titanium. There is no specific disclosure of a titanium tube.

Applicant notes that *Gandolfi* very carefully always states that the material of the tube lining or tube itself can be titanium, zirconium, or an alloy of one of them, possibly comprising

other metals. There is clearly no disclosure in *Gandolfi* that titanium and zirconium can be used together, otherwise *Gandolfi* would have used appropriate wording to include this possibility, and yet the Office Action relies on *Nagano* to teach the use of a zirconium coating on titanium tubes for the purpose of preventing corrosion. If *Gandolfi* teaches that titanium can be used on its own, then a person of ordinary skill in the art would understand that titanium needs no further protection from corrosion. Similarly, if one understands *Gandolfi* to teach that zirconium can be used on its own, then again a person of ordinary skill in the art would have no reason to add titanium. It is thus not reasonable to assume that a person of ordinary skill in the art would seek to do the opposite of the teaching of *Gandolfi* in order to use both titanium and zirconium.

Nagano is a method of preventing corrosion of a titanium alloy. Since a person of ordinary skill in the art already knows from *Gandolfi* that titanium itself is resistant to the corrosion encountered in tube bundle heat exchangers used for the production of urea, the choice of *Nagano* is not one that would have readily been made. The suggested arrangement would be against the teaching of *Gandolfi* that indicates zirconium and titanium solely and exclusively as alternative materials for an internal lining, not combinable the one with the other.

Nevertheless, as already pointed out, *Nagano* does not teach any method of depositing the zirconium on the surface of the titanium, nor any teaching that only a portion of the length of the titanium tube should be coated. *Nagano* does not even teach applying a layer of zirconium to titanium or coating the titanium, but rather places the zirconium in the environment in electrical contact with the titanium. *Nagano* thus appears to use the higher (negative) electrode potential of the zirconium so that the zirconium acts as a sacrificial metal. Although *Nagano* refers to the zirconium as being in the form of a passive film, there is no teaching that the film is continuous and forms a layer. *Nagano* further teaches only that the surface area of the zirconium is greater than or equal to 1/50 of the surface area of the titanium, and does not state where the zirconium is provided. Thus, there is no teaching of either supplying a tube or coating of zirconium to cover at least a portion of the interior of a titanium tube.

Finally, the Office Action argues that to hot draw or weld the "layer" of zirconium as allegedly taught by *Nagano* onto the titanium tube of *Gandolfi* is considered to be an obvious design choice. Yet, the Office Action has not cited any prior art references where this obvious design choice has been used.

Applicant notes that *Gandolfi* mentions the possibility of obtaining the bimetallic tubes made of stainless steel with an internal lining layer of titanium or zirconium by using the normal metallurgical techniques (see description page 18, line 25 to page 19, line 3). These techniques are only referred to with respect to the particular combination of stainless steel with titanium or zirconium, whereby according to *Gandolfi* welding is in any case not desired nor possible (see for instance, description, page 32, lines 14-17, page 8, lines 12, 20-21).

Therefore an apparatus having a bimetallic tube made of a first tube of titanium and a second tube of zirconium in which the zirconium tube is bonded to the titanium tube metallurgically or through welding is neither disclosed nor suggested by *Gandolfi* (if taken alone or in combination with *Nagano*).

Accordingly, the subject matter of present claims 1 and 13 is patentable over the cited art. Similar arguments apply to dependent claims 2-12, which are believed to be allowable because of their dependence upon an allowable base claim, and because of the further features recited.

II. Conclusion

Applicant has made every effort to present claims which distinguish over the prior art, and it is thus believed that all claims are in condition for allowance. Nevertheless, Applicant invites the Examiner to call the undersigned if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance. In view of the foregoing remarks, Applicant respectfully requests reconsideration and prompt allowance of the pending claims.

Respectfully submitted,

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Mark D. Passler
Registration No. 40,764
Sarah E. Smith
Registration No. 50,488
AKERMAN SENTERFITT
Post Office Box 3188
West Palm Beach, FL 33402-3188
Telephone: (561) 653-5000